

REMARKS/ARGUMENTS

Claims 1-13, 23, and 24 are now pending in this Application. Claims 1-13, 23, and 24 were rejected by the Examiner. Claims 2 and 24 have been amended. No new matter has been added. Applicants respectfully request reconsideration of the rejections set forth in the Office Action dated March 18, 2003 in view of the preceding amendments and following remarks.

Claim 2 has been amended to state that the barrier has a top surface and the wafer has a top surface, where in the second position the top surface of the barrier is not above the top surface of the wafer. This is shown in FIG. 2B and FIG. 3B, where the top surface of the barrier 202, 304, is shown as not being above the top surface of the wafer 204. This is also described on page 7, lines 5 to 11, of the application.

Rejections Under 35 U.S.C. § 103

Claims 1-13, 23, and 24 are rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,213,658 to Ishida (hereinafter referred to as “Ishida”) in view of EP Patent 0676790 A1 to Hills et al. (hereinafter referred to as “Hills”). Applicants respectfully traverse.

Firstly, Applicants submit that combining the cited prior art as proposed in the Office Action is improper.

The Examiner asserts that it would have been obvious to modify the moveable focus rings of Ishida with the teachings of Hills. Applicants respectfully disagree. Hills teaches against moveable focus rings (see column 2, lines 16-22 and column 4, lines 14-25). Specifically, he states that moving parts “generate particulate contamination within the reactor chamber 126, thereby increasing the risk of loss of die yield due to such contamination” (column 4, lines 22-25). Applicants respectfully submit that the references must be taken in their entirety, including those portions which argue against an obvious combination. Bausch & Lomb, 230 U.S.P.Q. at 420. Since Hills explicitly teaches against the use of moveable focus rings, and Ishida focuses on moveable focus rings, the combination of Ishida and Hills as proposed in the Office Action is improper.

For prior art references to be combined to render obvious a subsequent invention under Section 103, there must be something in the prior art as a whole that suggests the desirability, and thus the obviousness of, making the combination. In contrast, the combination of prior art cited in the Office Action includes no such motivation; and Hills indeed includes explicit support for non-combination with Ishida. Hills uses focus rings with plural openings because he feels moveable focus rings are detrimental.

For at least these reasons, Applicants respectfully submit that the proposed combination of prior art is improper. In addition to the improper combination, the cited references, either alone or in combination, fail to teach features recited in the independent claims.

In addition, regarding claim 1, neither Ishida nor Hills disclose or make obvious separate and sequential chemical driven etches and an ion driven etches in the same chamber, that eliminates edge effects for both types of etches. Page 2, lines 3 to 26, of the application describes how chemically driven plasma etching differs from ion driven etching. Ishida discloses a chemical driven etch, using reactive chemicals of CF_4 , CHF_3 , Cl_2 , and HCl (col. 3, line 37, of Ishida) to perform the etch. Ishida does not disclose or make obvious performing an ion driven etch in the same chamber. The chamber in Ishida would not inherently allow for ion driven etches with etch uniformity. As shown in FIG. 2B, of the application, to provide ion driven etches with etch uniformity, the barrier does not extend above the wafer 204 or the upper surface 220 of the focus ring 210. Hills adds nothing to eliminate this deficiency. For at least these reasons, claim 1 is not made obvious by Ishida in view of Hills.

Claim 8 recites “and the second position does not substantially prevent the diffusion of gases over the wafer within the plasma processing apparatus”. As mentioned above and in the Specification, a diffusion barrier is believed to quench the plasma and thus disturb the ion density uniformity in the plasma during an ion assisted/driven etch. The focus ring of Ishida is clearly shown to position well above the wafer (see FIG. 1). Even if the focus ring as illustrated were given maximum translation according to the illustrations of FIGs. 1-4, the focus ring would still be well above the wafer (see FIGs. 1-4) and prevent the diffusion of gases over the wafer (its intended purpose) and interfere with the etch uniformity of an ion driven etch

process. Nowhere does Ishida teach that his focus ring is capable of recessing to any point lower than shown, nor does he teach a desire for such positioning. On page 3 of the Office Action dated June 18, 2002, the Examiner asserts that the height of Ishida's focus ring may be adjusted during the etching operation (column 4, lines 1-9). However, Ishida only teaches one type of etching (chemical). More importantly, Ishida only teaches a desire to move his barrier the height of individual layers on a single wafer for this one etching type, which comprises minimal motion. Thus, in all the drawings and teachings of Ishida, the focus ring would be well above the plane of the wafer, and therefore disturb an ion-assisted etch process. Ishida therefore does not teach or suggest a second type of processing or the positioning of a barrier as recited, or teach or remotely suggest a desire to move his focus ring to facilitate such a process. Although Ishida in col. 2, lines 35-38, and col. 4, lines 29-31, teaches using optimal etching conditions, Ishida does not teach or suggest an ion driven etch, where such a barrier is avoided so that in the second position the barrier does not substantially prevent the diffusion of gases over the wafer within the plasma processing apparatus, as recited in claim 8. As mentioned above, Ishida does not teach a single chamber that can perform both a chemical driven etch and an ion driven etch, but instead only teaches a chemical driven etch in a chamber. Hills does not address these deficiencies, and teaches a focus ring that would interfere with the etch uniformity of an ion driven etch process. For at least these reasons, claim 8 as not made obvious by Ishida in view of Hills.

Claims 2-7, 9-13, 23, and 24 each depend either directly from independent claims 1 and 8, respectively, and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to the independent claims. Further, the dependent claims recite additional elements which when taken in the context of the claimed invention further patentably distinguish the art of record.

For example, claim 2, as amended, recites that the barrier has a top surface and the wafer has a top surface, where in the second position the top surface of the barrier is not above the top surface of the wafer. This is not disclosed or made obvious in Ishida nor Hill. Although Ishida in col. 2, lines 35-38, and col. 4, lines 29-31, teaches using optimal etching conditions, as mentioned above, the device shown in Ishida

does not seem capable of being adjusted to allow the top surface of the barrier to be not above the wafer.

In addition, claim 4, recites that the chuck is moved to establish the first and second position of the barrier relative to the wafer. The Examiner did not specifically recite anything that discloses or makes obvious the movement of the chuck.

In addition, claim 24, as amended, recites “further comprising a focus ring surrounding the chuck with an upper surface, wherein the barrier is situated below the wafer and within the focus ring such that the barrier is either flush with or below the upper surface of the focus ring in the second position.” Applicants note that the Examiner has used a barrier and a focus ring synonymously, and that Ishida and Hills both teach one focus ring in their respective apparatus. Logically then, the art of record cannot be used to teach or suggest both a barrier and a focus ring as recited in dependent claim 24, as amended.

Withdrawal of the rejection of claims 1-13, and 23-24 based on 35 U.S.C. § 103(a) is therefore respectfully requested.

Claim Objections

The Examiner objected to the numbering of the claims. The applicant accepts the Examiner’s renumbering of claims 14, 15 as 23, 24.

Rejections Under 35 U.S.C. § 112

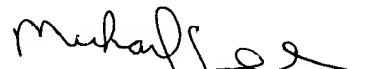
Claims 23 and 24 are rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification . The Examiner stated that the applicant has not shown where in the specification teaching of the barrier is recessed so as to not disturb an ion-assisted etch process and the barrier is situated below the wafer and within the focus ring, such that the barrier is either flush with or below an upper surface of the focus ring in the second position. Page 7, lines 1 to 11, of the application states that FIG. 2B illustrates the barrier in a recessed position where it does not act as a barrier and thus does not compromise an ion driven process and that in this embodiment, the barrier 202 is situated below an upper surface 220 of the focus ring 210 such that it is either flush with or below an upper surface of the focus ring 210.

Conclusion

In view of the foregoing, Applicants believe that all pending claims are allowable and respectfully requests early Notice of Allowance from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below. If any fees are due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account 50-0388 (Order No. LAM1P111).

Respectfully submitted,

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